

A NEW FRESHWATER CRAB OF THE GENUS
GEOTHELPHUSA (CRUSTACEA: DECAPODA:
BRACHYURA: POTAMIDAE) FROM KAGOSHIMA
PREFECTURE, SOUTHERN KYUSHU, JAPAN

Hiroshi Suzuki and Eiji Tsuda

Abstract.—A new freshwater crab, *Geothelphusa exigua*, is described from Kagoshima Prefecture, southern Kyushu, Japan. It is differentiated from *G. dehaani* (White 1847) and *G. candidiensis* Bott, 1967, in possessing distally narrowed eyes, presence of granules both on the lower edge of the epistome and on the groove between the subhepatic and pterygostomial regions, and laterally curved male first gonopod with a subterminal genital opening. This is the second species known from the Japanese mainland.

Among the eight species of the genus *Geothelphusa* known from Japan, *G. dehaani* (White 1847) is the only species known to occur on the Japanese mainland (north of Honshu southward to Nakano-shima of the Tokara Islands, south of Kyushu) (de Haan 1835; White 1847; Stimpson 1858; Rathbun 1898, 1904, 1905; Miyake & Chiu 1965; Miyake & Minei 1965; Bott 1967, 1970; Minei 1973, 1974b). The other seven species, *G. obtusipes* Stimpson, 1858, *G. sakamotoana* (Rathbun, 1905), *G. aramotoi* Minei, 1973, *G. tenuimana* (Miyake & Minei 1965), *G. levicervix* (Rathbun 1898), *G. candidiensis* Bott, 1970, and *G. miyazakii* (Miyake & Chiu 1965), are restricted to the Ryukyu Islands, including Amami-Oshima.

During our current study of the geographical distribution of *G. dehaani* in southern Kyushu, unusual specimens of a freshwater crab of the genus *Geothelphusa* were found on the Ohsumi Peninsula of Kagoshima Prefecture. The unusual eyes and male first gonopods of these crabs indicate that they represent a new species which is herein described and illustrated.

The holotype is deposited in the National Science Museum, Tokyo (NSMT), and the paratypes are in the Marine Biological Laboratory, Faculty of Fisheries, Kagoshima

University, Kagoshima (KUMB) and the Kitakyushu Museum of Natural History, Kitakyushu (KMNH). Measurements shown in parentheses under “*Material examined*” indicate the maximum carapace width in millimeters. Abbreviations used include: Cr and cr, crustacea; IvR, Invertebrate Recent.

Family Potamidae Ortmann, 1896
Genus *Geothelphusa* Stimpson, 1858
Geothelphusa exigua, new species
Figs. 1–3

Material examined.—Kimotsuki River: Futamata-gawa, 400 m alt., 11 Jul 1991; 7 ♂ (13.1–21.8), 3 ♀ (12.2–13.0), holotype, ♂ (21.0), NSMT-Cr 11314, KUMBcr 1039, KUMBcr 1041: Iwaya-gawa, 220 m alt., 25 Sep 1991; 1 ♂ (20.5), KUMBcr 1042: Nana-tsudani, Kushira-gawa, 400 m alt., 11 Jul 1991; 1 ♂ (18.8), 2 ♀ (13.2, 13.4), KUMBcr 1041: Takakuma valley, Kushira-gawa, 180 m alt., 22 Oct 1991; 1 ♂ (16.8), KUMBcr 1045: Naganomaki, Aira-gawa, 180 m alt., 11 Jul 1991; 6 ♂ (13.3–22.6), 4 ♀ (15.9–24.4), KMNH-IvR 900001–900004, KUMBcr 1041. Honjo River: Sarugajo valley, 150 m alt., 22 Oct 1991; 1 ♂ (19.6), KUMBcr 1045. Ohsumi Kamino River: Hangaishi, 300 m alt., 25 Sep 1991; 1 ♂ (20.8), KUMBcr 1042.

O River: Onigauto, Fumoto-gawa, 300 m alt., 9 Aug 1989; 3 ♂ (11.2–14.8), 2 ♀ (16.2, 17.8), KUMBcr 1038, KUMBcr 1040: Uchinomaki, Shibata-gawa, 380 m alt., 9 Aug 1989; 2 ♂ (12.6, 14.3), 4 ♀ (13.0–28.7), KUMBcr 1040: Shinden, 330 m alt., 25 Sep 1991; 1 ♂ (18.7), KUMBcr 1042: Ohfujigawa, 520 m alt., 9 Aug 1989; 2 ♀ (12.7, 26.7), KUMBcr 1040: Ohtakeno, Akasegawa, 600 m alt., 9 Aug 1989; 1 young (6.9), 2 ♂ (8.7, 17.8), 3 ♀ (13.9–15.6), KUMBcr 1037, KUMBcr 1040. Hirose River: Magome, 450 m alt., 2 Oct 1991; 1 ♀ (24.7), KUMBcr 1043. Kubota River: Himekado, 160 m alt., 25 Sep 1991; 1 ♂ (20.4), KUMBcr 1042. Funama River: Gorogamoto, 380 m alt., 2 Oct 1991; 1 ♂ (9.9), 1 ♀ (19.0), KUMBcr 1043. Hitotsutani River: Uchinoura, 390 m alt., 2 Oct 1991; 1 ♂ (16.7), KUMBcr 1043. Ohura River: Uchinoura, 300 m alt., 8 Oct 1991; 1 ♂ (14.4), KUMBcr 1044. Hetsuka River: Sarutubo, 490 m alt., 8 Oct 1991; 1 ♂ (25.0), 1 ♀ (27.5), KUMBcr 1044: Dohgabarū, 180 m alt., 8 Oct 1991; 1 ♂ (16.4), KUMBcr 1044.

All specimens were collected by H. Suzuki and E. Tsuda.

Diagnosis.—Male first gonopod saber-like, penultimate segment slightly curved laterally, ultimate segment strongly curved laterally, tapering, genital opening subterminal. Ocular peduncle swollen proximally, cornea small.

Description.—Carapace much broader than long, smooth and devoid of hair (Fig. 1a), postfrontal and postorbital regions indistinctly rugose, faint oblique striae on epibranchial and posterolateral regions, epibranchial and uro-gastric regions distinct, former divided into two parts by median depression, cervical groove obsolete on epibranchial region. Anterolateral margin of carapace cristate, lined with fine rounded granules, epibranchial notch rudimentary. Frontal margin 0.35 (0.33–0.40 in male, 0.31–0.38 in female) times as broad as carapace. Posterior margin of epistome divided into three parts by 2 deeper notches (Fig. 1b), granules

present on lower edge of epistome, absent medially. Lower orbital margin and groove between subhepatic and pterygostomial regions lined with small rounded granules.

Eyestalk short, proximally swollen, distally slim (Fig. 1a, b). Cornea small, slightly wider than distal portion of ocular peduncle.

Merus of third maxilliped broad, square, with deep punctum (Fig. 1c). Three-segmented palp connected on inner distal angle of merus, tip of palp not below distal margin of ischium. Exopod slender, longer than ischium, with small flagellum (Fig. 1c, d).

Chelipeds asymmetrical in males over 13.0 mm carapace width (right larger than left in 26 out of 28 males, left larger than right in remainder), symmetrical in all females and in males less than 13.0 mm; large chela 2.09 (1.82–2.27) times as long as high (Fig. 1e), palm smooth and surfaces relatively rounded, fingers with 2 longitudinal ridges on outer lateral surface (Fig. 1e, f). Carpus of large cheliped slightly smooth, with stout inner tooth below which is a low swelling (Fig. 2a). Carpus of small cheliped without any swelling below stout inner tooth.

Palp of mandible 3-segmented (Fig. 2b), distal segment uniramous and sickle-shaped, median segment longer than wide, distal half expanded, proximal segment short, stout.

Adult male first gonopod saber-like (Fig. 2c–h), penultimate segment slightly curved laterally, synovial membrane short, about 3 times as long as broad (Fig. 2c), ultimate segment strongly curved laterally (Fig. 2c, d), tapering, with genital opening subterminal in position (Fig. 2e). Tip of first gonopod papilla-like in specimen 8.7 mm carapace width (Fig. 2f), and tapered in specimens 11.2 and 14.6 mm carapace width (Fig. 2g, h). Male second gonopod slender, flat, weakly convex, with small lamella on distal one-third (Fig. 2i, j).

Sizes (carapace width).—Males, 8.7–25.0 mm; females, 12.2–28.7 mm.

Color in life.—Chocolate brown or dark brown with scattered black speckles on car-

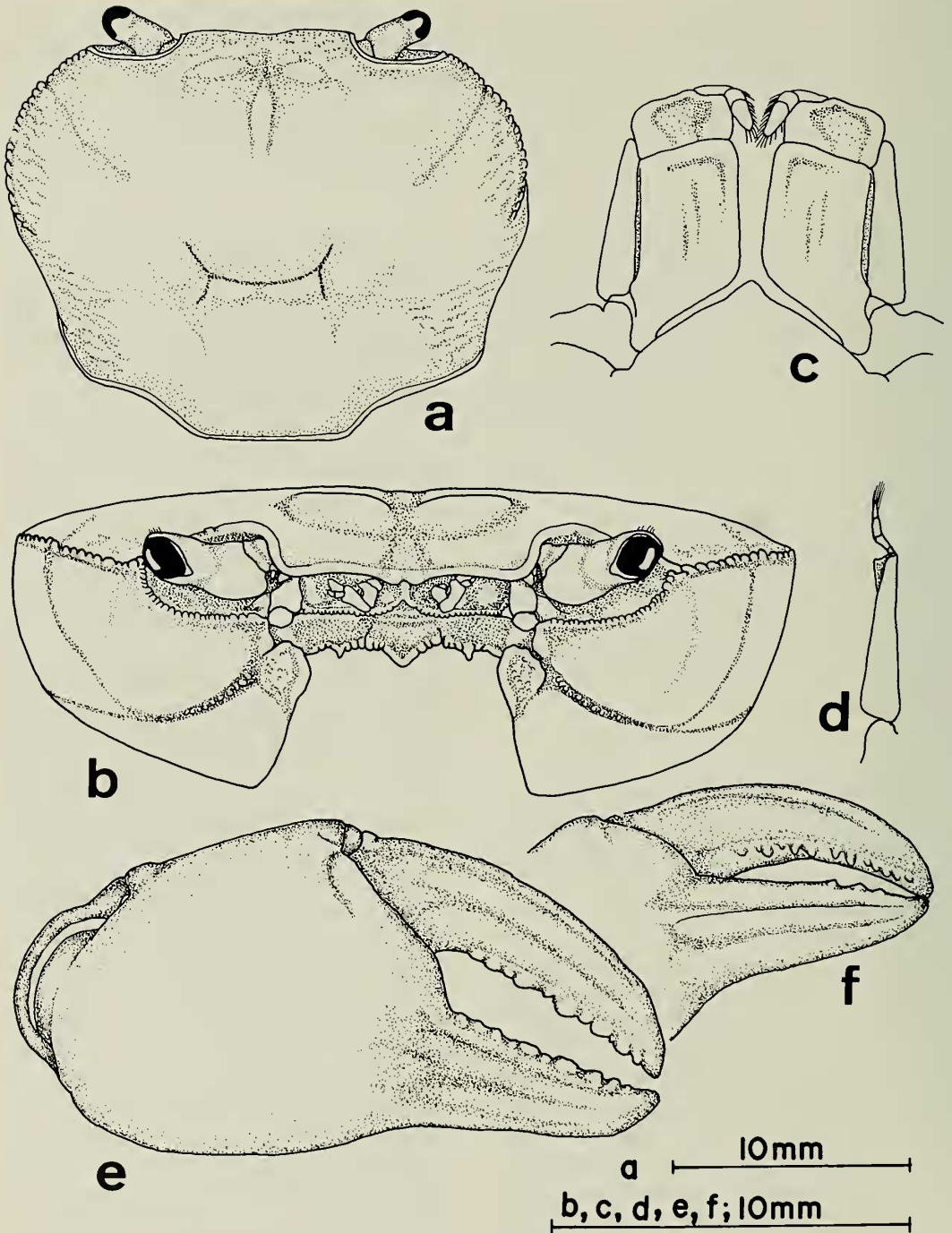


Fig. 1. *Geothelphusa exigua*, new species, male holotype (NSMT-Cr 11314): a, dorsal view; b, frontal view; c, third maxilliped, frontal view; d, exopod of third maxilliped, frontal view; e, right cheliped, lateral view; f, fingers, ventrolateral view.

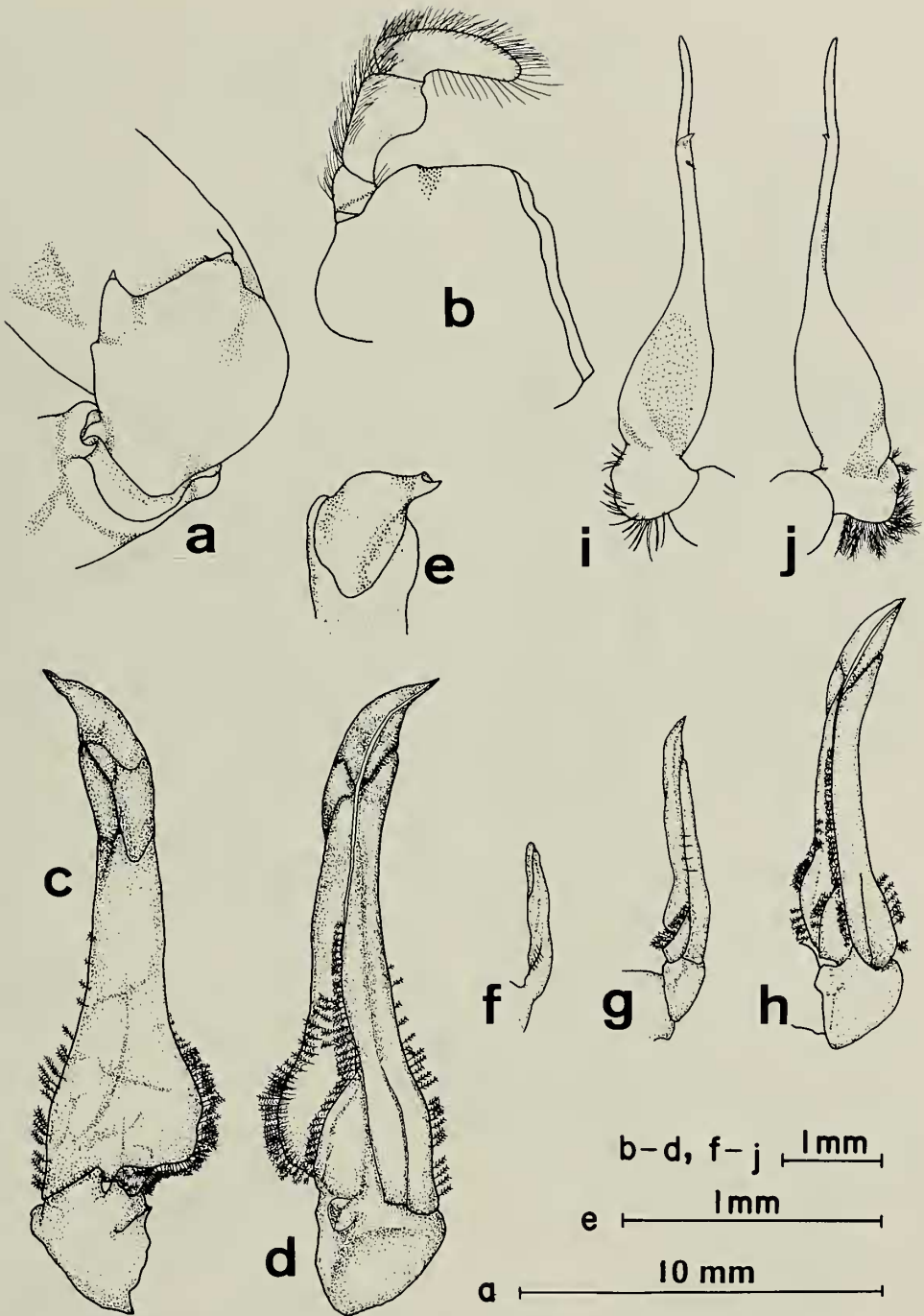


Fig. 2. *Geothelphusa exigua*, new species, male holotype (NSMT-Cr 11314): a, carpus of right cheliped, dorsal view; b, right mandibular palp, ventral view; c, left first gonopod, dorsal view; d, same, ventral view; e, distal part of same, distal view; i, left second gonopod, dorsal view; j, same, ventral view. Male paratypes (KUMBr 1037-1039): f, left first gonopod (8.7 mm carapace width), ventral view; g, same (11.2 mm carapace width), ventral view; h, same (14.6 mm carapace width), ventral view.

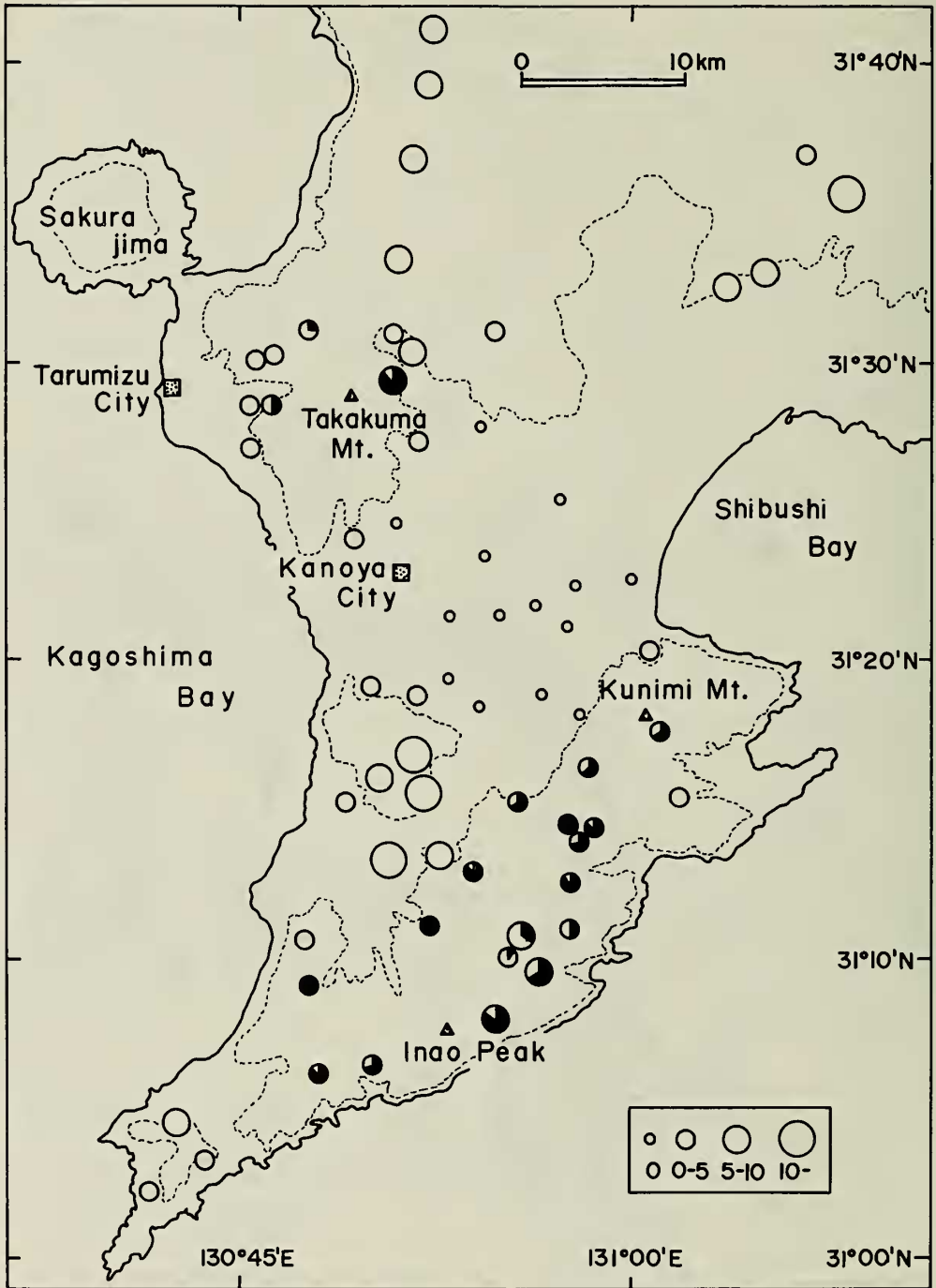


Fig. 3. Map showing the distribution and abundance of *G. exigua*, new species (black part) and *G. dehaani* (white part) in Ohsumi Peninsula, Kagoshima. Arabic numerals corresponding to size of circles in the square at bottom right indicate the numbers of crabs captured per ten minutes by one person. Broken line shows 150 m contour line.

apace and pereopods. Palm of chelae chocolate brown, fingers milk white. No color variation between sexes and sizes.

Etymology.—The specific name is derived from the Latin “exiguus” (small), alluding to the small cornea, characteristic of the new species.

Remarks.—The saber-like male first gonopod and the 3-segmented mandibular palp with an uniramous distal segment displayed by the new species are characteristics of the genus *Geothelphusa* (see Bott 1970). The medium-sized carapace, smooth palm, and broad frontal region ally the species with *G. dehaani* and *G. candidiensis*, from which it is distinguished by several features.

The most definitive differences may be seen on the male first gonopods. The ultimate segment in *G. dehaani* and *G. candidiensis* is straight or slightly curved mesially (Bott 1967, 1970; Minei 1973, 1974a), ending in a papilla-like tip with a terminal genital opening. In the new species, however, this segment is strongly curved laterally and tapering, having a subterminal genital opening. The eyestalks in both related species are constricted at the middle, and the cornea and the proximal part of the ocular peduncle are swollen. In the new species, only the proximal part of the ocular peduncle is swollen, the cornea and the distal part of the peduncle are proportionately narrower. The postorbital and epibranchial regions of the carapace bear finely crenulate striae in *G. candidiensis* (see Minei 1973), instead of faint striae as in *G. exigua*. Examination of specimens of *G. candidiensis* reported by Minei (1973), and now in the collection of the Kitakyushu Museum of Natural History, Kitakyushu (5 ♂, 4 ♀, ZLKUm 1016, Maezato, Ishigaki-jima, 28 Oct 1962, leg. S. Kudaka; 19 ♂, 18 ♀, ZLKUm 1019, Pansan-gara, Ishigaki-jima, 19 May 1963, leg. S. Kudaka), shows that there are distinct granules on the median part of the lower edge of the epistome which are barely discernible in the new species. The presence of distinct granules on the groove between the

subhepatic and pterygostomian regions also differentiates *G. exigua* from *G. dehaani*. The carapace and pereopods of *G. dehaani* show color variation, for example red, orange, blue, brown, purple, or yellowish white (Chokki 1976, 1980; Suzuki & Tsuda 1991). The palm and fingers of *G. dehaani*, however, are usually yellowish white, regardless of carapace color. In *G. exigua*, the carapace and pereopods are chocolate brown or dark brown, and only the fingers are milk white. In addition, allelic substitution was observed at General protein-1 and -2, Lactate dehydrogenase, and Isocitrate dehydrogenase-2 loci between *G. exigua* and *G. dehaani* (Suzuki & Tsuda, pers. comm.).

Distribution.—The specimens of *G. exigua* examined have been obtained only in the area above 150 m altitude on Takakuma Mountain, Inao Peak, and Kunimi Mountain Ranges, in Ohsumi Peninsula, Kagoshima Prefecture (Fig. 3), where the Miocene granitic rock and quartz porphyry are exposed. *Geothelphusa exigua* and *G. dehaani* are sympatric, having been taken together at many locations.

Acknowledgments

We thank K. Baba of Kumamoto University, C. L. McLay of the University of Canterbury, and M. Türkay of the Naturmuseum und Forschungsinstitut Senckenberg, for their critical readings of the manuscript. Thanks are also extended to P. K. L. Ng and R. Lemaitre for their valuable comments on the manuscript. We are also indebted to M. Takeda of National Science Museum, for his comments and to M. Ota and Y. Yabumoto of the Kitakyushu Museum of Natural History, for allowing us to examine the specimens under their care and the use of laboratory facilities.

Literature Cited

- Bott, R. 1967. Potamiden aus Ost-Asien (*Parapotamon* De Man, *Sinopotamon* n. gen., *Candidi-*

- opotamon* n. gen., *Geothelphusa* Stimpson) (Crustacea, Decapoda).—*Senckenbergiana biologica* 48(3):203–220.
- . 1970. Die Süßwasserkrabben von Europa, Asien, Australien und ihre Stammesgeschichte. Eine Revision der Potamoidea und der Parathelphusoidea. (Crustacea, Decapoda).—*Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 526:1–338 + pls. 1–58.
- Chokki, H. 1976. Preliminary report of the colouration of freshwater crab, *Geothelphusa dehaani* (White), with special reference to its distribution.—*Researches on Crustacea* 7:177–182. (in Japanese with English summary).
- . 1980. Notes on the colouration of freshwater crab, *Geothelphusa dehaani* (White), in northern districts of Japan.—*Researches on Crustacea* 10: 57–60. (in Japanese with English summary).
- Haan, W. de 1833–1850. Crustacea.—*In* P. F. von Siebold, ed., *Fauna Japonica sive descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batava imperium tenent, suscepto, annis 1823–1830 collegit. Notis, observationibus et adumbrationibus illustravit, XVII + XXXI + IX–XVI + 243 pp., pls. A–J, L–Q + 1–55; Lugduni-Batavorum.* [Leiden].
- Minei, H. 1973. Potamoid crabs of the Ryukyu Islands, with descriptions of five new species (Crustacea, Decapoda, Potamoidea).—*Journal of the Faculty of Agriculture, Kyushu University* 17:203–226.
- . 1974a. Potamoid crabs of Taiwan, with description of one new species (Crustacea, Decapoda).—*Journal of the Faculty of Agriculture, Kyushu University* 18:239–251.
- . 1974b. Studies on the freshwater crabs of Japan I. Genus *Geothelphusa* Stimpson.—*The Nature and Animals* 4(3/4):8–12. (in Japanese).
- Miyake, S., & J. K. Chiu. 1965. A new potamonid crab, *Potamon (Geothelphusa) miyazakii* sp. nov., as an intermediate host of the lung-fluke from Formosa.—*Journal of the Faculty of Agriculture, Kyushu University* 13:595–600.
- , & H. Minei. 1965. A new fresh-water crab, *Potamon (Geothelphusa) tenuimanus* sp. nov., from Okinawa-jima, the Ryukyu Islands.—*Science Bulletin of the Faculty of Agriculture, Kyushu University* 21:377–382. (in Japanese with English summary).
- Ortmann, A. E. 1896. Das System der Decapoden-Krebse.—*Zoologische Jahrbücher. Abteilung für Systematik, Geographie und Biologie der Tiere* 9:409–453.
- Rathbun, M. J. 1898. Descriptions of three new species of fresh-water crabs of the genus *Potamon*.—*Proceedings of the Biological Society of Washington* 12:27–30.
- . 1904. Les crabes d'eau douce (Potamoniidae).—*Nouvelles Archives du Muséum d'Histoire Naturelle* 6:225–312.
- . 1905. Les crabes d'eau douce (Potamoniidae).—*Nouvelles Archives du Muséum d'Histoire Naturelle* 7:159–321.
- Stimpson, W. 1858. *Prodromus descriptionis animalium evertibratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit, pars 5, Crustacea Ocypodidea.*—*Proceedings of the Academy of Natural Sciences of Philadelphia* 10:93–111.
- Suzuki, H., & E. Tsuda. 1991. Study on the color variation and distribution of a freshwater crab, *Geothelphusa dehaani* (White), in Kagoshima Prefecture.—*Benthos Research* 41:37–46. (in Japanese with English summary).
- White, A. 1847. List of the specimens of Crustacea in the collection of the British Museum. viii + 143 pp. British Museum, London.

Marine Biological Laboratory, Faculty of Fisheries, Kagoshima University, 4-50-20 Shimoarata, Kagoshima 890, Japan.